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ABSTRACT

In this practicum students' (n=27) learning styles were used to develop teaching lessons and strategies that would improve mathematics learning in a second grade classroom. Each child's learning style was determined through the Swassing-Barbe Modality Index (SBMI). Pretests for mathematics concepts were given. Each concept was then taught incorporating each of the learning styles. Posttests indicated an increased level of understanding and achievement by the target group. Daily logs and records indicated an improvement in work habits and attitudes. It was determined that testing learning style preferences and teaching to these preferences can result in an increase of learning and achievement. Included in this study are the purpose, research and solution strategy, method, results, and recommendations. Appended are a sample of daily records, copies of pretests and posttests, lesson plans, and a sample of a SBMI record sheet. (Author/KR)

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ADDRESSING THE THREE TYPES OF LEARNING STYLES TO ENHANCE THE UNDERSTANDING OF SECOND GRADE MATH CONCEPTS

by

PATRICIA A. WOJCIK

U.S. DEPARTMENT OF EDUCATION
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A Practicum Report

submitted to the Faculty of the Center for the Advancement of Education at Nova University, in partial fulfillment of the requirements for the degree of Master of Science.

The abstract of this report may be placed in a National Database System for reference.

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ABSTRACT

Addressing the Three Types of Learning Styles to Enhance the Understanding of Second Grade Math Concepts.
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Descriptors: Learning Styles/Auditory Learning/Visual Learning/Kinesthetic Learning/Multi-Sensory Learning/Learning Style Inventory/Individualized Instruction/Primary Math/Fractions/Geometry/Multiplication/Elementary Education/

An incorporation of learning styles (the three perceptual preferences - auditory, visual and kinesthetic) was developed and implemented to improve second grade math. Each child's learning style was determined through the Swassing-Barbe Modality Index (1979). Pre-Tests for math concepts were given. Each concept was then taught using the three types of learning styles. Post-Tests followed indicating an increased level of understanding and achievement by the target group. Daily logs and records indicated an improvement in work habits and attitudes. It was determined that testing learning style preferences and teaching to these preferences can result in an increase of learning and achievement. Appendices include a sample of daily records, pre-tests, post-tests, lesson plans and a sample of SBMI Record Sheet.

Authorship Statement

I hereby testify that this paper and the work it reports are entirely my own. Where it has been necessary to draw from the work of others, published or unpublished, I have acknowledged such work in accordance with accepted scholarly and editorial practice. I give this testimony freely, out of respect for the scholarship of other professionals in the field and in hope that my work, presented here, will earn similar respect.

Signed _____

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CHAPTER I

PURPOSE

Background

The setting for this practicum is a city in the southwestern United States. The metropolitan population is approximately 700,000. The city is home to half of the state's population. Its main industry is gaming which fosters a lure of easy money creating a high transient rate.

The school district in this city has grown from 86,927 students in 1979 to approximately 104,500 students in 1989. The General Operating Budget has increased from $147,160,560 in 1979 to $350,280,342.00 in 1989. It's the largest school system in the state and the eighteenth in size of pupil enrollment in the United States. It covers an area of 7,927 square miles.

At present the school district has 88 elementary schools, 19 junior high schools, 16 senior high schools and four special schools which brings a total of 127 schools. In 1988 a 10-year school building program was approved by the school board of trustees and the voters

of the county. During the next 10 years, 54 elementary schools, 13 junior high schools, 10 senior high schools, 90 portables and additions to existing schools will be constructed.

Due to the rapid growth of this city, many of the elementary schools in the district have been forced to go year-round. Whether a school is year-round or nine months, the children are taught 180 days.

The school where this practicum was implemented is a nine month school approximately five miles from the downtown area. The population of the neighborhood surrounding the school is mainly White, middle-class. Most of the Black children that attend the school are bussed from the west side of town to provide for integration. The neighborhood has changed a great deal in the last few years due to new housing development. While it was mainly single-family homes in the past, it now has a large influx of apartments.

The projected enrollment for the school for 1989-90 year was a little over 700 students. As of March, 1990 the enrollment was 890 students. Teachers and portables had to be added. At present, there are four kindergartens, five first grades, five

second grades, six third grades, five fourth grades, four fifth grades and three resource rooms. Most of the classrooms contain at least 30 students.

Due to the large number of apartments there is a large transient rate at the school. At the end and the beginning of each month there is quite a turnover of students going and coming.

The classroom where the practicum took place was a second grade, containing 28 students. Twenty-two were White, three were Hispanic and three were Black. There were 15 boys and 13 girls. There have been as many as 31 children at one time in the classroom during the school year. The school transient problem has only slightly affected this classroom.

The children in the classroom seemed to be an average group with a fairly equal amount of high, medium, and low students. Three of the children were mainstreamed to the resource room. One of these children attended the special education room for all academics while the other two returned to the regular classroom for the math.

The writer of this practicum and the teacher of this class has taught second grade for three years. Previous

teaching experience includes 10 years in resource and self-contained special education classrooms.

The length of the student school day excluding lunch and recess time is 300 minutes. Sixty-one minutes daily are required by the district to teach second grade math. The math philosophy of the school district is "Instruct each student toward maximum achievement in the knowledge of mathematics and proficiency in the use of the fundamental process of quantitative reasoning and expression."

The district policy for adopting math texts is to allow each individual school to choose the series that they feel will meet their classrooms' needs. However, the district does provide a list of approved publishers from which to choose.

The school where the practicum took place selected a math series for the fall of 1987. At the second grade level the text is consumable and includes supplements that may be reproduced for practice, re-teaching, and enrichment. This grade level also makes use of math packets that have been developed by fellow teachers.

The principal of the school feels strongly that the year a series is adopted, whether it be math, reading, or

another academic, the high priority objective should be based on the use of the series. In the fall of 1987 when the school first began using the new math series, additional funds were used to purchase manipulatives to a aid in teaching math. This money came from discretionary funds such as money made from ice cream sales.

The writer's concern was that the class in question had not achieved to their potential in math. A lack of interest was shown by many of the children and their parents.

Problem Statement

Mathematics is often a very difficult subject for many children. At the second grade level many concepts are introduced that are hard for the children to fully understand or grasp. Renaming, fractions, money, time, are just a few examples. Oftentimes children will memorize math facts yet have no idea what the numbers symbolize.

Other teachers in the school expressed their concern for the lack of understanding and interest in math. All felt that adequate materials were provided, but something

was missing. The bright students were being reached but the medium and low students were having a difficult time.

Each individual teacher in the school determines their own grading scale. The second grade teacher that implemented this practicum used a scale of 90-100 percent being an A grade, 80-89 percent being a B, 70-79 percent being a C, 60-69 percent a D, and anything below 59 percent was an F.

At the beginning of the school year the first nine weeks was spent on math review of what was taught in first grade. This included addition and subtraction facts to 18 and place value of tens and ones. At that time, five students earned a grade of A, 13 earned a B, six earned a C, and three earned a D.

The second nine weeks money, time, measurement and addition of two-digit addition without renaming were all introduced. Many of the students' grades dropped at this point. Four students earned an A grade, 11 earned a B, nine earned a C, and three remained with a D.

Two-digit addition and subtraction with renaming and place value to 999 were introduced the third nine weeks. During this time, three students earned an A, seven

students earned a B, 12 students earned a C, and five students earned a D.

All grades were based on work that was turned in and test scores. The teacher of this class felt that average work should be at least a grade of 80 percent. By the third nine weeks, more than half the class was doing below average work.

Table 1

A Comparison of Individual Student's Grades
For the First Three - Nine Weeks

Student #	1st 9 wks	2nd 9 wks	3rd 9 wks
1	A	A	A
2	B	B	C
3	C	C	C
4	B	B	B
5	B	B	B
6	A	A	A
7	B	B	C
8	A	A	A
9	A	B	B
10	B	B	B
11	B	C	C
12	B	C	C
13	C	C	C
14	D	D	D

Table 1 (Continued)

Student #	1st 9 wks	2nd 9 wks	3rd 9 wks
15	B	B	C
16	B	C	C
17	A	A	B
18	C	C	C
19	B	B	C
20	D	D	D
21	B	B	C
22	C	C	B
23	B	B	B
24	B	B	C
25	D	D	D
26	C	C	D
27	C	C	D

At the end of the year this second grade would be expected to have mastered all of the math concepts required of that grade level. The number of students doing average or above work should have been increasing rather than decreasing.

From the beginning the majority of the class had an "attitude" towards math. Many of the children displayed a disinterest in doing their math. Any uncompleted daily work was sent home as homework to be completed and

returned the next day. Oftentimes the teacher never saw the work again.

Parents were called, notes were sent, and unsatisfactory notices went home. Little or no response came from these efforts.

While a wide variety of things probably contributed to the class' lack of interest in math, the teacher felt that the main problem was the children's inability to grasp the concepts. A program needed to be designed and implemented to improve mathematical understanding.

Outcome Objectives

The student's lack of interest and low test scores revealed a needed change in the way math was being taught. The following objectives were implemented by the teacher to bring about these changes.

Objective I

Over a period of ten weeks, at least 75 percent of the students were to demonstrate a more positive attitude towards math. This was measured by teacher observation and a daily record of received and completed work (Appendix A:33).

Objective II

Over the same ten week period, at least 75 percent of the students were to improve their weekly math test grades. This was measured by comparison of the Form A pre-test that was given prior to each concept being taught and the Form B post-test that was given after completion of the follow-up math concept activities (Appendix B:35 and Appendix C:39).

Objective III

On the first day of the ten week period a math pre-test was given. This contained examples of the three concepts that were to be mastered by each student. A similar post-test was given on the last day of the ten week period. Each student was expected to master at least 75 percent or more of the concepts (Appendix D:43 and Appendix E:46).

CHAPTER II

RESEARCH AND SOLUTION STRATEGY

When our country was new, teaching was less complex. If children did not demonstrate an aptitude for learning, they were not encouraged to attend school. It was not considered necessary for everyone to read, write, or be able to do math. One of the family members should be able to read the Bible aloud and one should be able to take care of the family accounts.

Today, teaching is more difficult. Everyone is offered the opportunity of an education. Now children are obligated to attend school and expected to graduate from high school with a functional use of reading and math (Browne, 1986).

In Keefe's study in 1982, he states that educators have been seeing ways to meet individuals' needs for thousands of years. Socrates sought to meet the individual's needs in what is known as the Socratic method. Rousseau suggested a need to meet the individual's needs in Emile. As early as 1892, there was an interest in learning styles. Preoccupation with

searching for one mode that would improve student learning and methodological questions suppressed the research.

Dewey was critical of the emphasis on curriculum development which did not take into account each child's own experiences and individual characteristics. A well-known educator wrote to Dewey thirty years later : "So far as my observation goes - all of them (schools) start with pre-determined curriculum, and most, if not all of them, seek to apply one uniform standard of achievement" (Reiff, 1984).

Dunn and Dunn (1982), along with many other educators, became involved in the study of learning styles in the 1960's. The setting was laboratories where students' individual characteristics were responded to and identified. After years of testing and experimentation, a system of thirty to thirty-six different style elements could be addressed in the classroom. Their Learning Style Inventory is a self-report inventory which aids students in identifying those conditions under which they may learn best. This inventory includes immediate environment, emotionality, and sociological factors and physical needs. It wasn't

until 1981-1982 that Cavanaugh, Fiske, and Lemmon were able to verify that these elements could have a positive impact on classroom instruction. It has now been documented through St. John's University Center for the Study of Learning that teaching students using their own learning styles result in: (1) an improvement in academics ; (2) school attitudes changing for the better, and (3) discipline problems decreasing.

Perrin (1982) became concerned that as early as kindergarten, many children lose interest in learning. As a result, The Learning Style Inventory : Primary was designed and developed to test young children and how they prefer to learn. The children tested are kindergarten through second grade. The format is pictures and questions that identify a child's learning in four areas. These include (1) the environment (sound, light, temperature, design) ; (2) emotional tendencies (motivation, persistence, and responsibility, structure); (3) sociological needs (peers, adults, alone) ; and (4) physical requirements (perception, intake, time, mobility). Between 1977 and 1981 this testing instrument was used by more than 400 school districts in the United States. It has been revised several times.

Kusler (1982) encourages teachers to be aware of their students' learning styles and to individualize, diagnose, and prescribe. Once a procedure for determining learning styles is established, many changes may take place. Teachers become more aware of their methods of teaching and improve or expand on them. Multimedia equipment becomes an important tool in the classroom. Responding more to individual learning styles may cause whole schools to restructure.

Warner (1982) points out that in an age where techniques and approaches have come and gone, two important characteristics from the 70's emerged and remain today. These are diagnosis and treatment of individual learning styles and the resulting suitability of the learning environment.

Even though there is an awareness that all individuals do not learn in the same way, Brown and Cooper (1983) suggest that teachers often teach in the style that they have been most successful with in their teaching or their own learning. They feel that when we force children to receive information in a style which is not their own, we could be creating stress, fostering a loss of motivation and lowering performance results.

They further suggested that many children labeled as learning disabled were not learning disabled at all but rather mistaught in a learning style other than their own. The authors expressed the need for teachers to understand the concept of learning styles, recognize what style each of their students possess and teach in a manner that will meet the needs of those styles. It is also important that teachers know what their own individual learning style may be.

According to Oppenheim (1989) one of the curriculum areas where we seriously fail children is math. Oftentimes children are forced to fit the curriculum rather than the curriculum fitting the children.

Teaching math has undergone many changes. Most of the parents of today were subjected to "new math." There was a great deal of pressure put upon schools during the 50's and 60's to update math programs. An emphasis was shifted from computation skills and rote memory to teaching the language and concepts of math. Teachers and administrators began throwing out programs that stressed drill and computation skills. Consequently, this approach failed, but the nature and scope of the instruction of math improved. Today math programs

include the old and the new. It was concluded that math "language" is best taught and learned when integrated with other studies.

A rich math program is more than daily workbook pages. It is important to know how to add, subtract, multiply, and divide, but children need to understand the reasoning behind these operations and need to know when to do them. The workbook does have its place but math must begin with experiences that children can identify with and will later lead to an understanding of the basic concepts.

Oppenheim goes on to explain that if children are expected to deal with abstract symbols of math, then we must provide manipulatives. Young children need sensory experiences. This could include counting their fingers, beads, sticks or using number lines. Parents and teachers often worry that these manipulatives will become "crutches", but when children no longer need them, they will give them up. For primary-aged children these support items provide security.

A good math teacher actively involves the children, varying the way a lesson is taught or presented, integrates math into other subjects and teaches the

children to be aware of the many measuring tools that can be used.

The author of this practicum realizes that the term learning styles involves a very broad field. For this study, the emphasis was on perceptual preferences. These are defined by Dunn and Dunn as (1) auditory-respond best when listening to verbal instruction ; (2) visual - respond best to what is read or observed ; (3) kinesthetic - respond best when totally involved as in whole-body movements or real-life experiences.

CHAPTER III

METHODOLOGY

Before the practicum proposal was written, the writer sought approval from the school principal. This administrator was already aware of the class' lack of interest and low test scores in math. The principal agreed that determining each child's learning style and teaching towards those styles might help the situation. It was agreed that the writer would keep the principal informed of the progress of the study.

The first step was to determine what each child's learning style was in regards to perceptual preference. A learning styles inventory was given to each student to determine this. The kit that was used to test each child's perceptual preference was The Swassing-Barbe Modality Kit. The format was match to sample. The author chose this kit because it was applicable for elementary children. Each of the three modalities (auditory, visual, kinesthetic) was tested. All of the children were tested individually by the teacher. This procedure took about 10 minutes per child. Once the

scores were interpreted, it was then known if each child's strongest modality of learning was visual, auditory, kinesthetic or a mixture of two or more. It was the author's intention that through this learning style experimentation that there would be an increased awareness of each child's needs, and math lessons could be adapted to better meet these needs (Appendix F:49).

Once each child's learning style was determined, the students were then given a pre-test of the concepts that were to be taught over the 10 week implementation period. Each child was given the full 61 minutes to take the test. The teacher encouraged the children to do their best but explained that there would be math problems they wouldn't know how to do (Appendix B:35).

Before each of the three concepts (geometry, fractions, multiplication) was introduced a pre-test was given to determine if any of the students had any prior knowledge of the subject matter.

Daily lesson plans were then written. The author carefully developed curriculum materials and teaching techniques that would accomodate all three learning styles. The Houghton Mifflin Mathematics teacher's guide was a great source of information for kinesthetic ideas

since it stresses the use of manipulatives. Many of the other ideas came from workshops the teacher had attended throughout the years and other second grade teachers were supportive with their suggestions (Appendix G:51).

Every lesson began with an auditory discussion. According to Swassing-Barbe an auditory learner learns best through verbal instruction and works out mathematical problems through talking.

The first day of each unit was spent talking about what the children were going to learn. All members of the class were encouraged to participate. A question-answer type format was used. As the lessons progressed, the discussion turned into a review of what they had learned and what they were still unable to grasp.

The teacher, a visual learner, has always stressed this type of learning style. The blackboard was used daily to aid the visual learners, while simultaneously the discussion was aiding the auditory learners.

The overhead projector was another source for visually explaining a lesson. Transparencies were easily made from reteaching, practice or enrichment sheets that came with the Houghton Mifflin series. The overhead was

often used to write on simply as a diversion from the blackboard.

The kinesthetic lessons took more planning and preparation. The simplest form was having the children go to the board or overhead projector themselves.

Even though there were very few kinesthetic learners in the class, it was very apparent that most of the students enjoyed the kinesthetic lessons. Manipulatives included colored construction paper, grid paper, play money, counters and interlocking cubes. It was very important that the materials were gathered ahead of time in preparation for the lesson. Oftentimes examples were made by the teacher and stuck on the blackboard with magnets.

The kinesthetic approach was not used every day as were the auditory and visual approaches. Manipulatives were usually used during the first two weeks of a unit. Each unit incorporated four-six different kinesthetic approaches.

To further assist the kinesthetic learners or any other interested child, manipulative centers were set up in the room. These included activities that correlated with the objectives of each math concept. Some of the

centers were previously purchased through a mail order company and others were teacher-made.

A daily log was kept on each child. Grades and daily work (whether each student's work was complete, incomplete or not turned in) were recorded (Appendix A:33).

This daily log was the author's most important tool for monitoring and evaluation. Through this assessment, it quickly became apparent that the program was working.

The final step of each unit was the post-tests. Again each student was given the full 61 minutes, if needed, to complete the test (Appendix B:35).

Each of the post-tests was compared to each of the pre-tests. Results were charted to see if each student had improved. If a child displayed difficulties on the post-test, the teacher then gave some one-to-one attention to the child to help eliminate the problem.

The final post-test covered the entire 10-week learning period. The post-test scores were compared to the pre-tests scores. This was the author's final evaluation tool to determine the success or failure of teaching to each learning style in the area of math (Appendix E:46).

CHAPTER IV

RESULTS

It was hoped through this learning style experimentation that the author would be able to have an increased awareness of each child's needs and would be better able to adapt the math lessons to meet these needs.

By using the Swassing-Barbe Modality Kit the teacher was able to determine each student's learning style preference. Of the 27 students tested, 18 were auditory learners, five were visual learners, one was a kinesthetic learner, one was combination of auditory and visual, and two were a combination of auditory and kinesthetic learners.

Through this testing, it soon became apparent why many of the students were having difficulties in the classroom. More than half of the students in the classroom were auditory learners. From the beginning of the school year it had been a very talkative class. Many of these auditory learners were the talkers. These children were encouraged to "talk out" each daily lesson

to increase their understanding of math. The teacher began letting the class participate more.

Table 2

Percentage Results of Swassing-Barbe Modality Testing of Each Individual Student

Student #	Visual	Auditory	Kinesthetic
1	28.21	43.59*	28.21
2	31.43	42.86*	25.71
3	12.50	45.83*	41.67
4	33.93	26.79	39.29*
5	28.57	44.64*	28.57
6	42.55*	23.40	34.04
7	34.29*	34.29*	31.43
8	40.91*	31.82	27.27
9	27.50	45.00*	27.50
10	31.11	45.00*	17.78
11	35.00	40.00*	25.00
12	37.80*	35.80	27.16
13	24.14	37.93*	37.93*
14	29.41	41.18*	29.41
15	44.74*	28.95	26.32
16	27.50	42.50*	30.00
17	34.48	39.14*	26.09
18	28.00	52.00*	20.00
19	26.47	41.18*	32.35

Table 2 (Continued)

Student #	Visual	Auditory	Kinesthetic
20	37.78	39.14*	26.09
21	42.11*	36.84	12.05
22	12.50	68.75*	18.75
23	29.55	40.91*	29.55
24	35.48	41.94*	22.58
25	33.33	66.67*	0.00
26	9.09	45.45*	45.45*
27	35.71	50.00*	14.29

* Dominant Learning Style

While everyone enjoyed going to the board or writing on the overhead projector, the visual learners were especially encouraged to do so. Also, when using manipulatives or making models this group needed to see an example.

The teacher found that the kinesthetic lessons were enjoyed by nearly all the students. The district where the practicum took place stresses manipulative math. As was previously stated, to develope kinesthetic lessons, the teacher spent many hours. Second graders are impatient and their attention lost if the teacher doesn't keep the lesson moving.

As the teacher began teaching to each learning style, daily work seemed to improve. Six of the children still did not get their work turned in until the next day, but this was definitely an improvement. Seventy-eight percent of the class turned work in on time.

Comparisons of pre and post tests of each concept showed that an improvement in learning was taking place. The fractions post-test indicated that 89 percent of the class scored 80 percent or above, the geometry and multiplication post-tests indicated that 93 percent of the class scored 80 percent or above.

Table 3

Percentage Results of Pre and Post Tests

Student #	Fractions Pre / Post	Geometry Pre / Post	Multiplication Pre / Post
1	0 / 100	90 / 80	53 / 87
2	0 / 100	100 / 90	0 / 93
3	10 / 100	80 / 50	73 / 73
4	0 / 100	80 / 90	80 / 100
5	100 / 100	60 / 100	7 / 100
6	0 / 100	90 / 90	100 / 87
7	0 / 80	90 / 100	0 / 100
8	0 / 100	90 / 90	0 / 93
9	0 / 100	80 / 80	7 / 100

Table 3 (Continued)

Student #	Fractions Pre / Post	Geometry Pre / Post	Multiplication Pre / Post
10	0 / 90	80 / 100	73 / 80
11	0 / 50	70 / 80	7 / 80
12	100 / 100	90 / 90	87 / 87
13	0 / 100	70 / 90	7 / 80
14	10 / 90	70 / 70	0 / 100
15	0 / 90	90 / 100	7 / 93
16	0 / 100	50 / 80	47 / 80
17	0 / 50	90 / 100	73 / 87
18	0 / 100	70 / 90	80 / 87
19	0 / 90	100 / 100	80 / 100
20	0 / 100	80 / 90	0 / 13
21	0 / 90	90 / 80	0 / 87
22	100 / 100	80 / 70	13 / 100
23	0 / 100	90 / 80	0 / 100
24	0 / 100	70 / 80	7 / 87
25	0 / 100	80 / 90	60 / 93
26	0 / 90	100 / 90	20 / 87
27	0 / 100	80 / 90	20 / 93

The final post-test which covered all three concepts resulted in 89 percent of the class mastering the skills.

Three of the students failed to master 75 percent of the post-test. Two of the children had been given

one-to-one attention after receiving low grades on the fractions post-test. The teacher felt that everything that could be done to help these children had been done.

The third objective of the practicum expected each child to master at least 75 percent of the concepts. This objective was not met. The author still felt that overall the practicum was a success and well worth the time spent doing it.

Table 4

Percentage Results of 10 Week Pre and Post Tests

Student #	Pre-Test	Post-Test
1	27	93
2	20	100
3	0	100
4	20	100
5	73	100
6	20	93
7	13	93
8	13	93
9	27	100
10	27	100
11	20	67
12	0	87
13	20	100
14	13	80

Table 4 (Continued)

Student #	Pre-Test	Post-Test
15	20	100
16	0	40
17	60	67
18	0	100
19	7	100
20	27	100
21	20	93
22	67	100
23	13	100
24	0	100
25	47	100
26	0	93
27	0	100

CHAPTER V

RECOMMENDATIONS

The author learned through research that a person's learning style preference cannot be changed. A visual learner learns by watching, an auditory learner learns by hearing instructions and a kinesthetic learner learns by doing.

Time does not permit teachers to solely teach auditorially to an auditory learner, visually to a visual learner or kinesthetically to a kinesthetic learner. We must teach to all three styles.

The author does not feel that it is necessary to test every child every school year to determine learning styles. Occassionally a child or a group of children will display learning difficulties. Assessing each child's learning style could be an intervention tool.

The Swassing-Barbe Modality Kit was borrowed from an educational consultant in the district. Most districts would probably be willing to purchase this kit or one similar for teachers' use.

A good math series will provide ideas to teach to all three learning styles. The teacher's edition can be an invaluable tool for ideas.

The author found that teaching to all three styles made math more interesting to the students and the teacher. Developing new lessons became a challenge. Other teachers had a wealth of ideas and previously taken in-services were also very helpful.

The author does not believe that teaching to individual learning styles is a panacea for solving all the learning difficulties children today seem to be experiencing. Nevertheless, teaching to each learning style would definitely make learning easier and more enjoyable to most children.

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APPENDICES

APPENDIX A

Daily Record

Daily Record

	Student	week #	week #	comments
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				

APPENDIX B

Form A Pre-Test

Geometry*

Form A
Pre-Test

name: _____ score: _____

date: _____

Is each pair the same shape and size? Write yes or no.

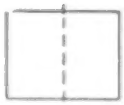
1. _____

2. _____

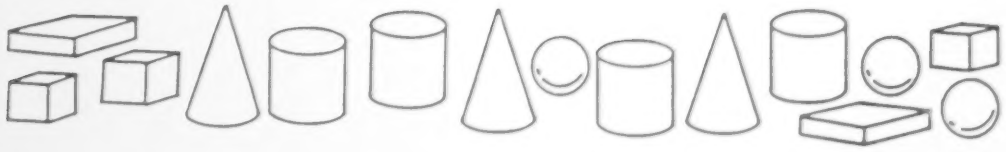
3. _____

Do the parts match when the shape is folded? Write yes or no.

4. _____

5.  _____

Write the number that tells how many.



6. _____ cones

7. _____ spheres

8. _____ cubes

9. _____ cylinders

10. How many more cylinders are there than cones? _____

44

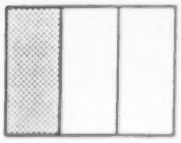
(* part of chap. 11 test- Houghton-mifflin)

Fractions*
Form A
Pre-Test

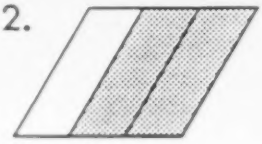
name: _____ score: _____

date: _____

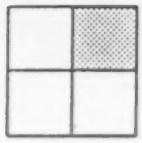
Write the fraction for the shaded part.

1. 

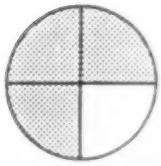
_____

2. 

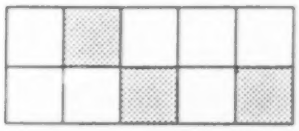
_____

3. 

_____

4. 

_____

5. 

_____

Write the fraction for the shaded part.

6.

_____

7.

_____

8.

_____

9.

_____

10.

_____

(* part of chap. 12 test - Houghton Mifflin)

Multiplication

Name 38

Date

Score

Chapter Test 13

Form A Pre-Test

Multiply.

1. $5 \times 3 =$ _____
2. $7 \times 2 =$ _____
3. $6 \times 3 =$ _____
4. $9 \times 2 =$ _____
5. $8 \times 3 =$ _____

Multiply.

6. $5 \times 4 =$ _____
7. $2 \times 5 =$ _____
8. $3 \times 4 =$ _____
9. $5 \times 5 =$ _____
10. $6 \times 4 =$ _____

Multiply.

11. $\begin{array}{r} 0 \\ \times 6 \\ \hline \end{array}$
12. $\begin{array}{r} 1 \\ \times 5 \\ \hline \end{array}$
13. $\begin{array}{r} 2 \\ \times 8 \\ \hline \end{array}$
14. $\begin{array}{r} 3 \\ \times 7 \\ \hline \end{array}$
15. $\begin{array}{r} 4 \\ \times 4 \\ \hline \end{array}$

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APPENDIX C

Form B Post-Test

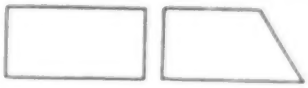
Geometry*
Form B
Post-Test

name: _____ score: _____

date: _____

Is each pair the same shape and size? Write yes or no.

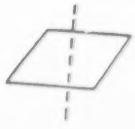
1. _____

2.  _____

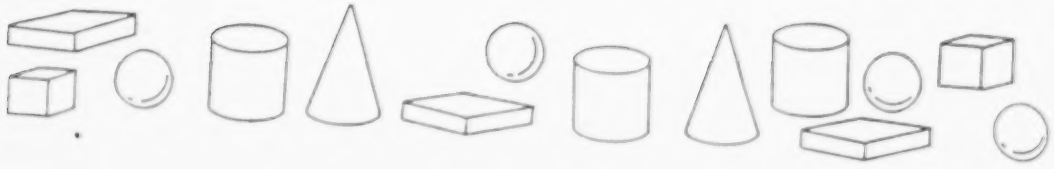
3. _____

Do the parts match when the shape is folded? Write yes or no.

4. _____

5.  _____

Write the number that tells how many



6. _____ cylinders

7. _____ spheres

8. _____ cubes

9. _____ cones

10. How many spheres and cones are there in all?

(* part of chap. 11 test - Houghton-Mifflin)

Fractions*
Form B
Post-Test

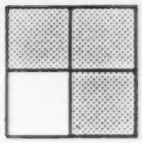
name: _____ _____

date: _____

Write the fraction for the shaded part.

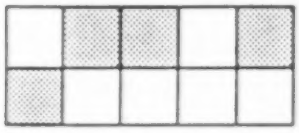
1.

2.

3. 

_____ _____ _____

4.

5. 

_____ _____

Write the fraction for the shaded part.

6.

7.

8.

_____ _____ _____

9.

10.

_____ _____

*(part of chap. 12 test - Houghton mifflin)

Name

Date

Score

Chapter Test 13

Form B Post-Test

Multiply.

1. $3 \times 3 =$ _____
2. $7 \times 3 =$ _____
3. $6 \times 2 =$ _____
4. $8 \times 2 =$ _____
5. $6 \times 3 =$ _____

Multiply.

6. $3 \times 4 =$ _____
7. $5 \times 4 =$ _____
8. $2 \times 5 =$ _____
9. $4 \times 4 =$ _____
10. $3 \times 5 =$ _____

Multiply.

11. $\begin{array}{r} 3 \\ \times 8 \\ \hline \end{array}$
12. $\begin{array}{r} 1 \\ \times 4 \\ \hline \end{array}$
13. $\begin{array}{r} 5 \\ \times 5 \\ \hline \end{array}$
14. $\begin{array}{r} 0 \\ \times 8 \\ \hline \end{array}$
15. $\begin{array}{r} 2 \\ \times 7 \\ \hline \end{array}$

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APPENDIX D

Ten Week Pre-Test

Ten-Week Pre-Test

name: _____ _____

date: _____

Write the fraction for the shaded part.

1.

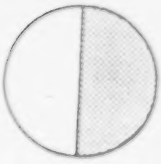
_____

2.

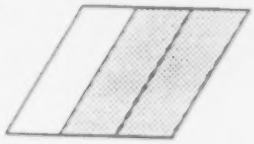
_____

3.

_____

4. 

_____

5. 

_____

Write the fraction for the shaded part.

6.

_____

7.

_____

8. Draw a cone.

9. Draw a cube.

Ten-Week
Pre-Test
page 2

10. Draw a sphere. 11. Draw a cylinder.

Multiply

12. $\begin{array}{r} 2 \\ \times\ 4 \\ \hline \end{array}$

13. $\begin{array}{r} 6 \\ \times\ 1 \\ \hline \end{array}$

14. $\begin{array}{r} 9 \\ \times\ 0 \\ \hline \end{array}$

15. $4 \times 5 =$ _____

APPENDIX E

Ten Week Post-Test

Ten-Week Post - Test

name: _____ score: _____

date: _____

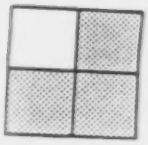
Write the fraction for the shaded part.

1.

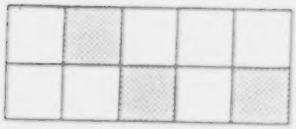
_____

2.

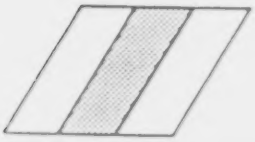
_____

3. 

_____

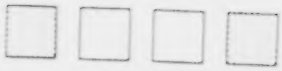
4. 

_____

5. 

_____

Write the fraction for the shaded part.

6. 

_____

7.

_____

8. Draw a cube.

9. Draw a sphere.

Ten-Week
Post-Test
page 2

10. Draw a cylinder. 11. Draw a cone.

Multiply

12. $\begin{array}{r} 6 \\ \times\ 2 \\ \hline \end{array}$

13. $\begin{array}{r} 4 \\ \times\ 1 \\ \hline \end{array}$

14. $\begin{array}{r} 5 \\ \times\ 2 \\ \hline \end{array}$

15. $3 \times 3 =$ _____

APPENDIX F

Swassing-Barbe Modality Index Record Sheet

Sample of Marked SBMI Record Sheet

SWASSING—BARBE MODALITY INDEX
RECORD SHEET

#_____ Date: 10/4

Name: Nancy Examiner: Mrs. Tate

Birthdate: _____ Sex: F ✓ M ___ Grade 5 Dominant Hand: L ___ R ✓

VISUAL TEST:
Show set of shapes, follow timing guidelines as outlined in directions. Remove card at end of time limit or when child indicates she/he is finished if before alloted time. Child assembles sequence just seen. Mark answer sheet. Stop test when child has made errors on two consecutive sets.

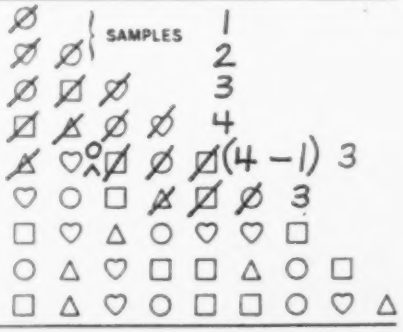
TOTAL VISUAL CORRECT: 24

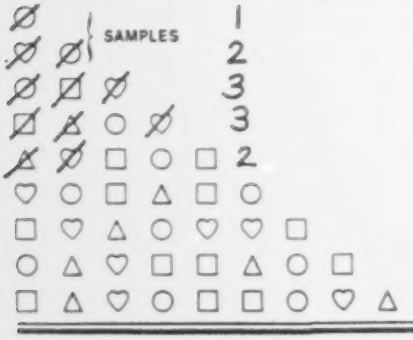
Before proceeding, ask child how she/he arrived at answer _____

AUDITORY TEST:
Read aloud the names of shapes in sequence at rate of one per second. Child assembles sequence of shapes just heard. Mark answer sheet. Stop test when child has made errors on two consecutive sets.

TOTAL AUDITORY CORRECT: 16

Before proceeding, ask child how she/he arrived at answer _____





KINESTHETIC TEST:
Holding shield so child cannot see shapes, put set in front of child; place child s dominant hand on first shape on left; child may use both hands. Do not speak during test. If child accidentally skips a shape, place her/his hand on missed shape. Follow timing guidelines as outlined in directions; remove set and shield. Child assembles sequence. Mark answer sheet. Stop when child has made errors on two consecutive sets.

TOTAL KINESTHETIC CORRECT: 11

Ask child how she/he arrived at answer _____

VISUAL CORRECT: 24
AUDITORY CORRECT: 16
KINESTHETIC CORRECT: 11
TOTAL CORRECT 51

PERCENTAGE VISUAL: 47 %
PERCENTAGE AUDITORY: 31 %
PERCENTAGE KINESTHETIC: 22 %

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APPENDIX G

Lesson Plans

Math Lesson Plans Using Auditory, Visual

and Kinesthetic Examples

Day 1 - 10-Week Pre-Test

2 - Geometry Pre-Test

3 - K: Distribute circles, squares, rectangles, isosceles triangles to each child. Have them fold in half and cut symmetrical designs.
A: Discuss shape, size, congruent parts.
V: Display on bulletin board.

4 - V: Draw on board - circle, square, triangle, rectangle.
A: Identify, discuss, label each one.
K: Make shapes with straws, pipecleaners.
Assignment: Workbook p. 293-294 Enrichment 11-1

5 - A: Define and explain congruent shapes.
V: Use overhead projector and grid paper to model rectangular and square shapes.
K: Give each child grid paper. Have them color shapes like those on overhead. Cut out shapes and work in pairs to match.
Assignment: Workbook p. 295-296 EN 11-2

6 - A: Define and explain symmetrical shapes.
V: Use demonstration shapes - square, rectangle, isosceles triangle, circle, and fold in half.
K: Hand out construction paper with dittoed circle, square, rectangle, isosceles triangle. Cut out, fold in half.
Assignment: Workbook p. 297-298 Reteaching 11-3

7 - Solve problems using patterns and logic
A & V - Say "Raise your right hand and your left hand. Now put your hands down. Raise your right hand or left hand.
Assignment: Do Practice 11-4 together, do p. 299-300

Day 8 - V: Distribute models of spheres, cubes, rectangular prisms
A: Discuss attributes of each
K: Color worksheet - spheres (red), cubes (yellow), rectangular prisms (blue). Cut and assemble cube shape.
Assignment: p. 301-302 Pract. 11-5

Day 9 - V: Distribute models of cylinders and cones.
A: Discuss attributes.
K: Roll cylinder on paper. Mark its path. Roll cone. Mark path. Ask children the shapes they made (rectangle and circle).
Assignment: p. 303-304 Pract. 11-6

10 - Chapter 11 Test (Workbook)
A & V: Do test. Correct together using blackboard.

11 - A & V: Review what's been learned. Discussion using blackboard. Introduce Learning Module 13 (math packet).
Assignment: p. 1-5

12 - A & V: Check answers from previous day using blackboard or overhead.
Assignment: p. 6-10 (math packet)

13 - A & V: Check answers
Assignment: p. 11-15

14 - A & V: Check answers
Assignment: Cumulative Review p. 311-312

15 - Geometry Post-Test

16 - Fractions Pre-Test

17 - K: Distribute three construction rectangles (1 red, 1 yellow, 1 blue) to each child. Label red - 1 whole. Fold yellow in halves. Label each 1/2. Fold blue in half then fourths. Label each 1/4.
A: Discuss what they've done with rectangles.
V: Use blackboard to demonstrate further.
Assignment: p. 314-315

18 - K: Give each student one whole circle and 3 thirds. Have them cover the whole circle.

A & V: Discuss activity and how 3 thirds makes a whole, etc. Use the overhead to further explain with examples (Reteaching 12-2).
Assignment: p. 315-316 Pract. 12-2

Day 19 - K: Same as previous day. Instead use 1 whole rectangle and 4 fourths.
A & V: Discuss activity using blackboard.
Assignment: p. 317-318 Enrich. 12-3

20 - A & V: Using board, review halves, thirds, fourths
Assignment: p. 319-320 Reteaching 12-4

21 - K: Hand each child 2 strips of 10 squares (from 10x10 grid paper). Have them mark each square in one strip with X's. Cut apart. Put X's on whole strip to demonstrate tenths.
A: Discuss.
V: Use overhead (Reteach 12-5)
Assignment: p. 321-322 Enrich. 12-5

22 - K: Children need play money from back of book.
A: Discuss how fractions are used with money.
V: Use board to demonstrate 1/2=$.50, 1/4=$.25, 1/10=Dime, etc.
Assignment: p. 323-324

23 - A & V: Use overhead to review previous day (Reteach. 12-6).
Assignment: Pract. 12-6, Enrich. 12-6

24 - K: Hand each child 4 counters. Using counters, have them identify halves, thirds, and fourths of groups.
A: Discuss fractions that can be made with counters.
V: Use board to write fractions.
Assignment: p. 325-326

25 - A & V: Use board to review previous day.
Assignment: Pract. 12-7, Enrich. 12-7

26 - Chapter 12 Test (Workbook)
A & V: Do Test. Correct together using overhead.

27 - A & V: Review what's been learned. Discuss using blackboard. Introduce Learning Module 14 (math packet).
Assignment: p. 1-4

28 - A & V: Check answers from previous day using blackboard or overhead.
Assignment: p. 5-9 (math packet)

Day 29 - A & V: Check answers.
Assignment: p. 10-14

30 - A & V: Check answers.
Assignment: p. 15-18

31 - A & V: Check answers.
Assignment: Cumulative Review p. 333-334

32 - Fractions Post-Test

33 - Multiplication Pre-Test

34 - A: Have children slap knees and clap hands. Count by 2's when clapping. Demonstrate with 4 children - 2 hands, 4 children, 8 hands in all, 4 two's.
V: Use overhead and do Reteach. 13-1.
Assignment: p. 335-336

35 - K: Every four children have 18 interlocking cubes. Have them join them in pairs of two.
A & V: Using the board (they use pencil and paper), write out addition facts and multiplication facts. (Example: 2 + 2 + 2 = 6, 3 two's = 6, 3 x 2 = 6)
Assignment: p. 337-338

36 - A & V: Discuss and write on blackboard multiples of two. Begin three's by asking number of wheels on a tricycle. Two tricycles, etc.
Assignment: p. 339-340 Enrich. 13-3

37 - K: Each child has 10x10 grid paper. Color 4 in first row. Put "4" behind it. color 4 in second row. Put "8" behind it, etc.
A: Discuss facts of 4.
V: Write facts on board.
Assignment: p. 341-342

38 - V: Draw 9 sets of 3 dots on board. Then add two more dots to each row.
A: Review counting by three's. Count by 5's.
Assignment: p. 343-344, Enrich. 13-5

Day 39 - K: Using paper and crayons, have each child draw pictures for multiplication problems using a fact for 2, 3, 4, 5.
A & V: Have each child show and explain their facts pictures.
Assignment: p. 345-346

40 - A: Discuss horizontal and vertical.
V: Show how multiplication can be written horizontally and vertically.
Assignment: p. 347-348

41 - A & V: Using the board, discuss the order property of addition.
K: Give each child 15 cubes and 5 pieces of string. Make 3 rows of 5 counters each. Put string around each group of 5. Next, make 5 groups of 3. Put string around each group of three. (3 X 5 = 5 X 3).
Assignment: p. 349-350

42 - A & V: Using the overhead do Practice 13-9 together. Discuss each story problem.
Assignment: p. 351-352

43 - Chapter 13 Test (Workbook)
A & V: Do test. Correct together using overhead.

44 - A & V: Using the board, discuss and review what's been learned in multiplication. Introduce Learning Module 18 (math packet).
Assignment: Do p. 1-4, Homework: p. 5-6

45 - A & V: Use board to check previous day.
Assignment: p. 7-10, Homework: p. 11-12

46 - A & V: Use board to check previous day.
Assignment: p. 13-16, Homework: p. 17-18

47 - A & V: Use board to check previous day.
Assignment: p. 19-22, Homework: p. 23-24

48 - A & V: Use board to check previous day.
Assignment: p. 25-28, Homework: p. 29-30

Day 49 - A & V: Use board to check previous day.
Multiplication Post-Test

50 - 10-Week Post-Test